

Corticolous Myxomycetes of Singapore

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Abstract

The moist chamber culture technique was employed to detect myxomycetes (plasmodial slime molds) associated with the bark surface of living trees. Twenty-five species of myxomycetes in 13 genera were identified from moist-chambered bark samples collected at three localities in Singapore. Seventeen species are new records for Singapore. One species, *Comatrixia pseudonigra* was previously known only from Mitchell River National Park in the state of Victoria, Australia.

Introduction

All previous published reports of myxomycetes (plasmodial slime molds) from Malaysia and Singapore have dealt with species that produce fruiting bodies which are large enough to be detected in the field (Chip, 1921; Sanderson, 1922; Emoto, 1931; Lister, 1931; Nawawi, 1973). Fruiting bodies of "corticolous" (bark-inhabiting) myxomycetes are usually too minute to be detected in nature but can be recovered from the bark of living trees by using the moist chamber technique of Gilbert and Martin (1933). The purpose of this study was to survey the myxomycetes of the bark microhabitat in Singapore.

List of localities

Localities from which bark samples were obtained are listed below. All samples were collected, in Singapore in October of 2007, by Dr. D.R. Reynolds, Mycologist at the University of California, Berkeley, while he was on a Research Fellowship at the Singapore Botanic Gardens.

Locality 1: Singapore Botanic Gardens (SBG)

Locality 2: MacRitchie Reservoir Forest Reserve (MRR)

Locality 3: Bukit Timah Nature Reserve (BT)

Materials and Methods

Samples of dead outer bark were collected from unidentified trees at each locality at a trunk height of approximately 1.5 m and placed in legal-sized paper envelopes. Once dried, they were shipped to the author for moist chamber culturing. There was only enough bark in each sample for a single moist chamber.

Bark samples were placed on filter paper in disposable Petri dishes (9 cm diam.) and flooded with sterile distilled water adjusted to pH 7.0 with KOH. Because substrate pH sometimes affects the abundance and distribution of myxomycetes (Stephenson, 1989; Wrigley de Basanta, 2004), excess water remaining after 24 hours was poured into clean plastic beakers where pH was determined using an Orion model 210A pH meter and low maintenance electrode. Moist chambers were incubated at room temperature (22-25°C) in a laboratory exposed to diffuse daylight and examined daily for a period of five weeks, longer if the bark was still producing fruiting bodies or plasmodia. Small amounts of water were periodically added to each culture to maintain moist conditions. If fruiting bodies of the same species of myxomycete appeared more than once on the same moist chambered bark sample, they were considered to be a single collection.

When mature, fruiting bodies were removed from the moist chambers along with the bit of substrate upon which they developed. Once air-dried, specimens were glued into herbarium quality boxes for permanent storage. Identifications were made using keys by Martin and Alexopoulos (1969) and Mitchell (2004).

Results

Twenty-five species of myxomycetes, many representing new records for Singapore, developed from the moist chambered bark. In the list that follows, myxomycetes are arranged alphabetically by genus and then species. One species, *Comatricha pseudonigra*, was previously known only from the Mitchell River National Park in the state of Victoria, Australia (Moreno *et al.*, 2007).

Nomenclature of Myxomycetes follows Hernandez-Crespo and Lado (2005) and uses the conserved names of a number of genera (Lado *et al.*, 2005) recently approved by the Committee for Fungi (Gams, 2005) of the IAPT. Collection numbers are those of the author (WCR). Specimens are curated at SING Herbarium. Where duplicate specimens exist, they are housed in the MTSU Herbarium (MTSU).

Annotated list of species

Arcyria cinerea (Bull.) Pers., Syn. Fung. (1801) 184. - Locality 1 (SBG): WCR 9787, 9788 and 9789, at pH 3.4 - 5.4; Locality 2 (MRR): WCR 9790, 9791, 9792 and 9793, at pH 3.4-4.8; Location 3 (BT): WCR 9794, at pH 4.1.

Arcyria minuta Buchet, Pat., Mem. Acad. Malgache 6 (1927) 42. - Locality 1 (SBG): WCR 9795 (slide only), at pH 6. Not previously known from Singapore.

Arcyria pomiformis (Leers) Rostaf., Mon. (1875) 271. - Locality 1 (SBG): WCR 9796, at pH 3.4; Locality 2 (MRR): WCR 9797 and 9798, at pH 3.4-4.8. Not previously known from Singapore.

Clastoderma debaryanum A. Blytt, Bot. Zeit. 38 (1880) 343. - Locality 1 (SBG): WCR 9799, at pH 6; Locality 2 (MRR): WCR 9800, 9801 and 9802, at pH 4.1-4.8; Locality 3 (BT): WCR 9803, at pH 4.1.

Collaria arcyrionema (Rostaf.) Nann.-Bremek. ex Ing. Ruizia 9 (1991) 26. - Locality 1 (SBG): WCR 9804 (slide only), at pH 5.4.

Comatricha elegans (Racib.) G. Lister, Guide Brit. Mycet. ed. 3 (1909) 31. - Locality 2 (MRR): WCR 9806 and 9807, at pH 3.4 - 4.1.

Comatricha pseudonigra G. Moreno, W.C. Rosing, D.W. Mitch. & S.L. Stephenson, Bol. Soc. Micol. Madrid 31 (2007) 172. - Locality 2 (MRR): WCR 9808, at pH 3.7. Previously known only from Mitchell River National Park, Victoria in Australia (37°40'03"S, 149°21'29"E).

Cribraria confusa Nann.-Bremek. & Y. Yamam., Proc. Kon. Ned. Akad. Wetensch., C. 86 (1983) 212. - Locality 1 (SBG): WCR 9809, at pH 4.6; Locality 2 (MRR): WCR 9810, 9811, at pH 3.8-4.5; Locality 3 (BT): WCR 9812, at pH 3.8. Not previously known from Singapore.

Cribraria microcarpa (Schrad.) Pers., Syn. Fung. (1801) 190, emend. Nann.-Brem. K. Ned. Akad. Wet. Proc. C. 69 (1966) 340. - Locality 2 (MRR): WCR 9813, at pH 4.8. Not previously known from Singapore.

Cribraria minutissima Schwein., Trans. Am. Phil. Soc. II. 4 (1832) 260. - Locality 2 (MRR): WCR 9814, at pH 3.4. Not previously known from Singapore.

Diderma chondrioderma (deBary & Rostaf.) G. Lister in Lister, Mycet. ed. 3 (1925) 258. - Locality 1 (SBG): WCR 9815, at pH 6; Locality 2 (MRR): WCR 9816, at pH 6.5. Not previously known from Singapore.

Diderma saundersii (Masse) Lado, Cuad. Trab. Fl. Micol. Iber. (2001) 35. - Locality 1 (SBG): WCR 9817, at pH 4.7; Locality 2 (MRR): WCR 9818, at pH 4.1. Not previously known from Singapore.

Didymium squamulosum (Alb. & Schwein.) Fr., Symb. Gast. (1818) 19. - Locality 3 (BT): WCR 9819, at pH 5.7.

Echinostelium minutum de Bary in Rost., Mon. (1874) 215. - Locality 2 (MRR): WCR 9820, 9821, 9822 and 9823, at pH 3.4 – 4.8. Not previously known from Singapore.

Hemitrichia calyculata (Speg.) M.L. Farr, Mycologia 66 (1974) 887. - Locality 2 (MRR): WCR 9824 at pH 4.8. Not known from Singapore but as noted in Martin and Alexopoulos (1969), this species is often mistakenly reported as *H. clavata* (Pers.) Rostaf., which has been reported from Singapore.

Licea biforis Morgan, J. Cinc. Soc. Nat. Hist. 15 (1893) 131. - Locality 2 (MRR): WCR 9825, at pH 6.5. Not previously reported from Singapore.

Licea eleanorae Ing, Myxomycetes Britain and Ireland (1999) 50. - Locality 1 (SBG): WCR 9826, at pH 6.2. Not previously reported from Singapore.

Licea kleistobolus G.W. Martin, Mycologia 34 (1942) 702. - Locality 1 (SBG): WCR 9827, at pH 4.7. Not previously reported from Singapore.

Licea operculata (Wingate) G.W. Martin, Mycologia 34 (1942) 702. - Locality 1 (SBG): WCR 9828, at pH 6.2. Not previously reported from Singapore.

Licea rugosa Nann.-Bremek. & Y. Yamam., Proc. Kon. Ned. Adad. Wetensch., C. 90 (1987) 326. - Locality 1 (SBG): WCR 9829, 9830 and 9831, at pH 4.1-7. Not previously reported from Singapore.

Macbrideola decapillata H.C. Gilbert, Univ. Iowa Stud. Nat. Hist. 16 (1934) 158, emend. Alexop., Mycologia 59 (1967) 113. - Locality 1 (SBG): WCR 9832 at pH 6.2; Locality 2 (MRR): WCR 9833 and 9834 at pH 4.8. Not previously reported from Singapore.

Physarum album (Bull.) Chevall., Fl. Gen. Env. Paris 1 (1826) 336. - Locality

3 (BT): WCR 9836, at pH 4.1.

Physarum crateriforme Petch, Ann. Bot. Gard. Peradeniya 4 (1909) 304. - Locality 1 (SBG): WCR 9837, at pH 7; Locality 2 (MRR): WCR 9825, at pH 6.5. Not previously known from Singapore.

Stemonitis fusca Roth, Mag. Bot. Romer & Usteri 1 (1787) 26. - Locality 1 (SBG): WCR 9839, 9840 and 9841, at pH 4.4-6.2.

Stemonitis herbatica Peck, Ann. Rep. N.Y. State Mus. 26 (1874) 75; Ing. Myxomycetes of Britain and Ireland (1999) 202. - Locality 3 (BT): WCR 9838, at pH 4.4.

Discussion

Seventeen myxomycete species are reported here as new records for Singapore. Most of these species produce minute fruiting bodies, which at 2 mm or less in total height, are unlikely to be detected in the field. A similar but more extensive study involving moist-chambered bark samples from 12 localities in the state of Victoria, Australia (Rosing *et al.*, 2007) produced twenty-nine new records for Victoria, eight new records for Australia, and one species (*Comatricha pseudonigra*) then new to science, but now known to exist in Singapore. It is unlikely that this species exists only in two locations, southeastern Australia and Singapore, some 6000 km apart. Tropical regions like Southeast Asia remain under-investigated for Myxomycetes. The moist chamber technique for the recovery of corticolous forms remains under-utilized. Further investigations will undoubtedly show that *C. pseudonigra* has an extensive range in the region and that many other species of myxomycetes remain to be discovered.

Stephenson (1989) noted that while most myxomycete species of upland temperate forests of Virginia (USA) appeared to tolerate a wide pH range, members of the Stemonitales tended to develop on more acidic bark than did members of the Physarales and Trichiales, predominating on the acidic bark of two species of conifers. The pH range (3.4-7) of bark samples utilized for the present study is almost identical to that reported by Stephenson (3.3-7.4) for his Virginia study.

Based on the present study, ten bark samples from Singapore produced members of the Stemonitales, ten produced members of the Trichiales, and eight produced members of the Physarales. The mean pH of bark that produced members of the Trichiales was actually lower (4.35) than that producing the bark members of the Stemonitales (4.74), though the pH ranges were almost identical (3.4-6.2) for the bark materials producing

members of the Stemonitales and members of the Trichiales (3.4-6). The eight bark samples that produced members of the Physarales had the highest mean pH (5.57) with a pH range of (4.1-7).

The author recently collected myxomycete fruiting bodies, tree bark, ground and aerial litter from a number of sites in Singapore while undertaking a research fellowship at the Singapore Botanic Gardens. It will be interesting to see whether any apparent correlation can be seen between the bark pH and distribution patterns of corticolous myxomycetes in the tropical rain forests of Singapore. Definitely, additional new records of myxomycetes for the island nation will be forthcoming.

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